

CLAIMS

- 1 1. A method of broadband radio frequency analysis comprising the steps of:
2 receiving a frequency hopping radio input signal for broadband analysis, said input
3 signal having segments at different hopping frequencies and different hopping
4 times,
5 for each segment,
6 determining from the input signal a hopping time of the segment,
7 processing the segment to determine a frequency of the segment, and
8 processing the segment to determine signal parameters.
- 9 2. The method of Claim A1 wherein said determining step determines the start time and the
10 stop time of the segment.
- 1 3. The method of Claim 1 wherein the input signal is an analog signal, wherein the analog
2 signal is down converted to an intermediate frequency signal and wherein the broadband
3 radio frequency analysis includes producing a digital signal by digitizing the intermediate
4 frequency signal.
- 1 4. The method of Claim 1 wherein the input signal is a base band signal and wherein the
2 broadband radio frequency analysis includes producing a digital signal by digitizing the
3 baseband signal.
- 4 5. The method of Claim 1 wherein the input signal is an analog signal and wherein the
5 broadband radio frequency analysis includes producing a digital signal by digitizing the
6 analog signal using alias sampling.
- 1 6. The method of Claim 1 wherein the input signal is an analog signal and wherein the
2 broadband radio frequency analysis includes producing a digital signal by digitizing the
3 analog signal.

- 1 7. The method of Claim 6 where the digital signal is stored in a FIFO memory.
- 1 8. The method of Claim 6 where the digital signal is stored in a memory having a capacity
2 sufficient to store the segments for a time period used for analyzing the digitized signal.
- 1 9. The method of Claim 6 where the digital signal is processed using digital signal processing.
- 1 10. The method of Claim 9 where the signal processing includes down converting, decimating
2 and filtering of segments to form converted segments.
- 1 11. The method of Claim 6 where the hopping time is determined using digital signal processing.
- 1 12. The method of Claim 6 where signal frequency is determined using digital signal processing.
- 1 13. The method of Claim 6 where signal parameters are calculated using digital signal
2 processing.
- 1 14. The method of Claim 1 where the radio frequency analysis includes the step of frequency
2 converting the input signal to a lower intermediate frequency.
- 1 15. The method of Claim 1 where the input signal is collected by a receive antenna.
- 1 16. The method of Claim 1 where the input signal is collected by a direct-wired connection.
- 1 17. The method of Claim 1 where the signal processing includes signal demodulation.
- 1 18. The method of Claim 1 where the signal processing includes measuring a signal rise time
- 1 19. The method of Claim 1 where the signal processing includes measuring a signal fall time.

- 1 20. The method of Claim 1 where the signal processing includes measuring an amplitude ripple.
- 1 21. The method of Claim 1 where the signal processing includes measuring a symbol rate.
- 1 22. The method of Claim 1 where the signal processing includes measuring a signal modulation
2 depth.
- 1 23. The method of Claim 1 where the signal processing includes determining transmitted
2 symbols.
- 1 24. The method of Claim 1 where the signal processing includes measuring symbol jitter.
- 1 25. The method of Claim 1 where the signal processing includes measuring segment duration.
- 1 26. The method of Claim 1 where the signal processing includes measuring an interval between a
2 start time of a first segment and a start time of a successive segment.
- 1 27. The method of Claim 1 where the signal processing includes identifying and measuring
2 amplitude and frequency for spurs, harmonics and stray signals.
- 1 28. The method of Claim 1 where the signal processing includes comparing measured signal
2 parameters with reference signal parameters to determine compliance with a specification.
- 1 29. The method of Claim 1 where the signal processing includes calculating a carrier frequency
2 for each segment.
- 1 30. The method of Claim 1 where the input signal is an analog signal, where the analog signal is
2 digitized to form a digital signal, where the signal processing includes calculating a carrier
3 frequency for each segment of the digital signal using spectral analysis.

- 1 31. The method of Claim 30 where the spectral analysis includes a digital Fourier transform.
- 1 32. The method of Claim 30 where the carrier frequency is calculated from a power spectrum
2 using a center of mass algorithm about a largest component in the power spectrum.
- 1 33. The method of Claim 32 where a mean value of the largest component in the power spectrum
2 is used to refine the carrier frequency calculation.
- 1 34. The method of Claim 1 where the signal processing includes calculating signal bandwidth.
- 1 35. The method of Claim 34 where bandwidth is calculated using spectral analysis.
- 1 36. The method of Claim 1 where the input signal is an analog signal, where the analog signal is
2 digitized to form a digital signal, where the signal processing includes calculating signal
3 bandwidth for each segment of the digital signal using spectral analysis and where the
4 spectral analysis uses a digital Fourier transform.
- 1 37. The method of Claim 36 where the bandwidth is based on identifying a bandwidth value
2 where a spectrum drops to a threshold level below a peak.
- 1 38. The method of Claim 37 where the bandwidth is based on the bandwidth containing a given
2 percentage of the signal energy.
- 1 39. The method of Claim 1 where the signal processing includes measuring a symbol rate and
2 where the symbol rate is calculated one for each signal segment independent of the other
3 segments.
- 1 40. The method of Claim 1 where the signal processing includes measuring a symbol rate and
2 where the symbol rate is calculated by spectral analysis.

1 41. The method of Claim 1 where the signal processing includes signal demodulation to form a
2 demodulated signal and where the signal processing includes measuring a symbol rate where
3 the symbol rate is calculated by analysis of zero crossing times in the demodulated signal.

1 42. The method of Claim 41 where time differences between zero crossings is calculated from
2 zero crossing times.

1 43. The method of Claim 42 where a TOT histogram is compiled of the time differences as
2 deltaTOTs.

1 44. The method of Claim 43 where a symbol period estimate of a symbol period is formed from
2 a center of mass of a first major peak in the TOT histogram.

1 45. The method of Claim 44 where the symbol period is calculated by,
2 computing the modulo of the delta TOTs and the symbol period estimate,
3 unwrapping the modulo results about the symbol period estimate,
4 fitting a straight line to the unwrapped data,
5 using a slope of the straight line to refine the symbol period estimate thereby
6 producing a final value for the symbol period.

1 46. The method of Claim 45 where the straight line fit uses a least squares fit.

1 47. A method of broadband radio frequency analysis comprising the steps of:

2 receiving an input signal for broadband analysis where said input signal has segments
3 wherein said segments have different segment frequencies, wherein each
4 segment has a segment frequency , wherein each segment has a segment
5 bandwidth, and wherein the segment frequency for each one of the segments
6 differs from the segment frequencies of other ones of the segments by amounts
7 that are greater than the bandwidth of one or more of the segments,

8 determining from the input signal start times and stop times of said segments, and
9 for each segment,

10 processing the segment to determine said segment frequency and said
11 segment bandwidth, and

12 processing the segment to determine signal parameters.

1 48. A method of broadband radio frequency analysis comprising the steps of:

2 receiving an input signal for broadband analysis where said input signal has segments
3 wherein said segments have different segment frequencies, wherein each
4 segment has a segment frequency , wherein each segment has a segment
5 bandwidth, and wherein the segment frequency for each one of the segments
6 differs from the segment frequencies of other ones of the segments by
7 amounts that are greater than the bandwidth of one or more of the segments,

8 determining from the input signal start times and stop times of said segments, and
9 for each segment,

10 processing the segment to determine segment amplitude between the start time and a
11 stop time,

12 processing the segment to determine said segment frequency and said segment
13 bandwidth, and

14 processing the segment to determine signal parameters.